



F5 Signaling Delivery Controller

Element Management System Overview

4.4

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About this Document

Document Name: F5 Signaling Delivery Controller Element Management System Overview

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Document Objectives

This document describes the F5 SDC Element Management System (EMS), the functionalities offered by the EMS.


Document History

Revision Number	Change Description	Change Location
May 2015 – Ver. 2	Trademark text changed	

Conventions

The style conventions used in this document are detailed in Table 1.

Table 1: Conventions

Convention	Use
Normal Text Bold	Names of menus, commands, buttons, user-initiated CLI commands and other elements of the user interface
<i>Normal Text Italic</i>	Links to figures, tables, and sections in the document, as well as references to other documents
Script	Language scripts
Courier	File names
 Note:	Notes which offer an additional explanation or a hint on how to overcome a common problem




Convention	Use
 Warning:	Warnings which indicate potentially damaging user operations and explain how to avoid them



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1. Introduction

1.1 What is the F5 SDC Element Management System?

The F5® Traffix® Signaling Delivery Controller™ (SDC) Element Management System (EMS) is designed to give you a convenient and efficient approach to managing multiple SDC sites, by having one central control point. With its system-wide performance view, analytics and reporting, the system allows you to take proactive actions and helps to ensure that the signaling network operates at top performance without a glitch.

In addition, analyzing signaling messages and traffic performance trends helps you pinpoint any element not operating as expected and to identify the potential cause.

With the SDC EMS you obtain real-time fine-grained visibility for both network-wide and individual component performance. Using the SDC EMS, you can identify specific peer disconnections or overloads, or plan further network expansion, ensuring that you maintain top network availability 24/7.

1.2 What does the EMS architecture look like and how does it work?

Designed to efficiently manage and monitor multi-site deployments, the EMS is offered as an add-on to the basic SDC deployment. As Figure 1 and Figure 2 show, information collected on servers of each individual SDC site is sent to the EMS site using an EMS agent. The EMS stores the data collected from all managed SDC sites in a reporting database. The collected information is displayed in the EMS Web UI, which present signaling network performance dashboard, where you can monitor the system and the signaling network faults and performance of all the managed SDC sites, generate fault and performance reports, as well as configure the sites from one central location.



Figure 1: EMS agent installed on SDC site

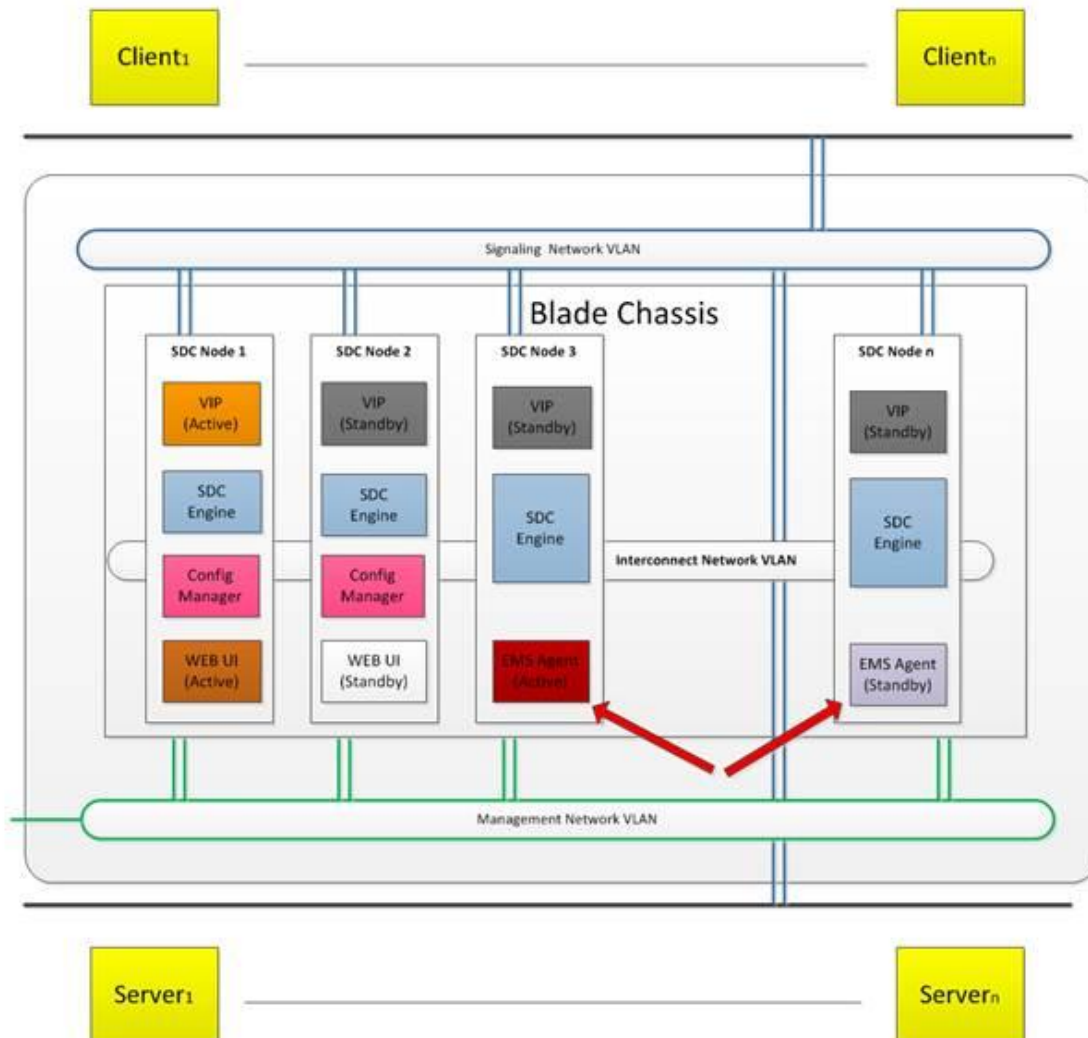
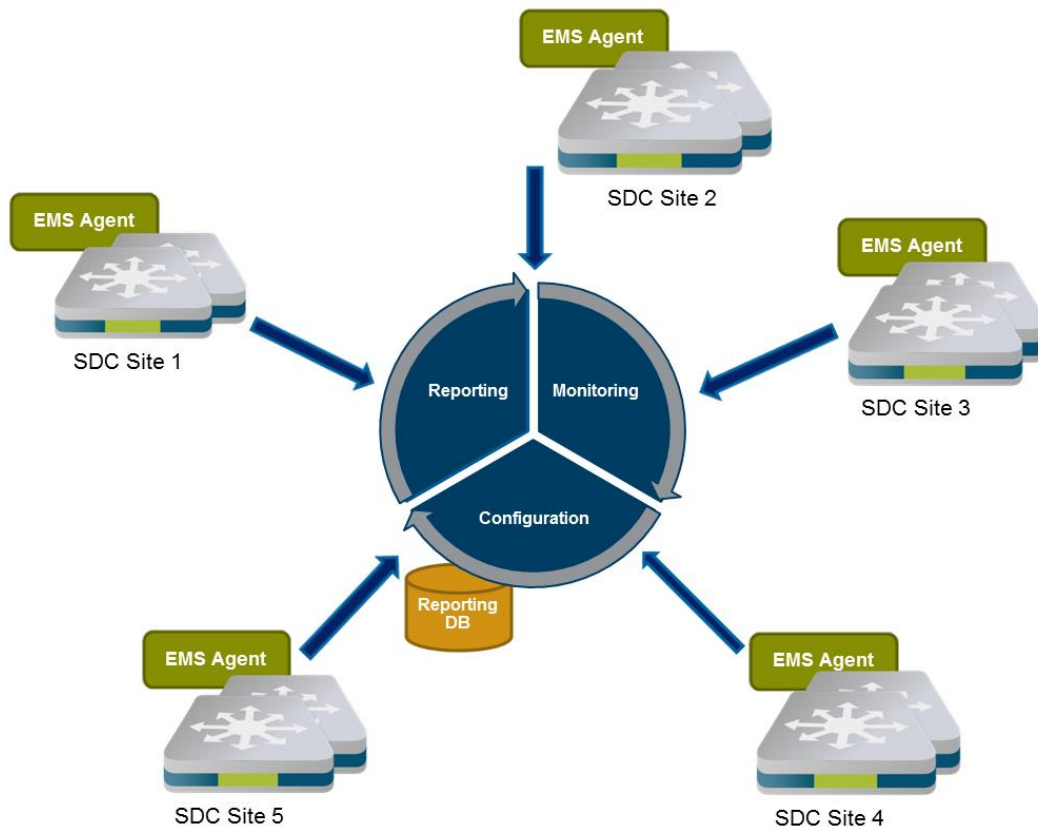




Figure 2: EMS Deployment





2. The F5 SDC Element Management System

The F5 SDC Element Management System (EMS) provides:

- Dashboard
- System-wide fault management and troubleshooting
- System-wide performance monitoring
- Control Plane analytics and short term tracing
- Central and local configuration options

2.1 Dashboard

The EMS provides a network-wide view of the interconnected SDC sites. The Dashboard screen provides a unique combined look at both the signaling network's behavioral patterns and the performance monitoring of the interconnected SDC sites. Its graphical presentation of the current status (snapshot) and historical trends of system's Key Performance Indicators (KPIs) to enable instantaneous and informed decisions to be made at a glance. Through this view, you can estimate your system's overall performance and quickly pinpoint potential faults.

The Dashboard screen, shown in *Figure 3*, is divided into the following areas:

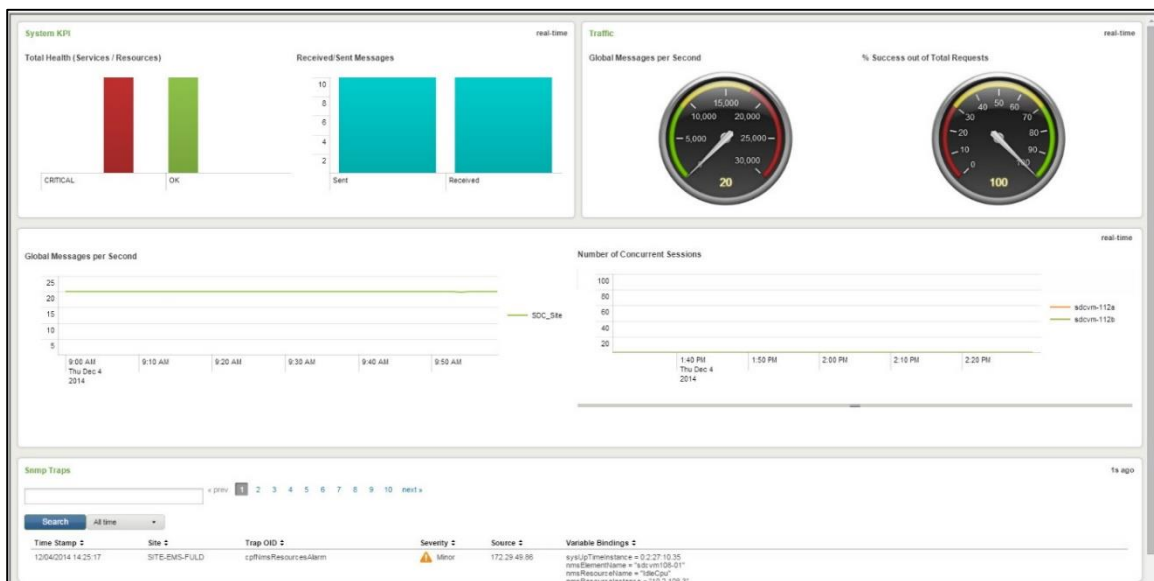
- System KPI – This area shows graphs indicating system-level overall health performance – such as system health and received/sent messages – facilitating quick identification of recent system failures. The System KPI information is displayed for the last minute and is refreshed in near real time.
- Traffic – This area shows gauges, indicating system-level traffic performance by displaying the number of global messages and the percentage of successful message transactions processed by all the SDC sites managed by the EMS.
- Performance Monitoring graphs: This area shows the graphs indicating the average processing time and session repository usage helping identify under-performing sites



and determine whether different behavior patterns are site-specific or indicate deeper underlying system-based issues. The Performance Monitoring information is displayed for the last hour and is refreshed in near real time

- **SNMP Traps:** This area shows the last 200 detected traps generated by all the SDC sites managed by EMS and the EMS itself. The information in this area helps to easily drill down and pinpoint specific system issues.

Figure 3: Dashboard Screen



2.2 Topology View

The Topology view displays all the SDC sites managed by the EMS. It provides one-click access to SDC site-specific monitoring and reporting information for each managed SDC site. By right-clicking on an SDC site, you easily zoom into it for more detailed monitoring and reporting. This screen indicates the status of the configuration distribution on each SDC site.



2.3 Fault management and Troubleshooting

2.3.1 Faults

Any specific fault in the network, such as a specific peer overload, network-level disconnection or any specific protocol-level issue raises an alert on the affected SDC site. The EMS presents a central view of the alerts generated by the different managed SDC sites. There is also an option to forward the alarms to an external network management system.

The alarms raised by the SDC include, but are not limited to, the following:

The alarms raised by the SDC include, but are not limited to, the following:

- Peer performance – these alarms indicate whether the peers are connected, disconnected, operating, or overloaded
- SDC Nodes performance – these alarms indicate whether the nodes are experiencing concurrent sessions overload or incoming queue overload
- HW performance – these alarms indicate whether the hardware components are experiencing CPU overload or whether a network link is disconnected

2.3.2 System Resource Monitoring

Configuring thresholds for main system categories enables system notifications in cases of extraordinary system behavior, helping you proactively fix the problem before it evolves into a serious one. The thresholds for all SDC sites managed by the EMS and the EMS site itself are configured in one central location. Default thresholds are predefined by the system.



Figure 4: Defined EMS Thresholds System-wide Monitoring

Submit

Edit...

Refresh

Category	Critical Threshold	Major Threshold	Minor Threshold
<input checked="" type="checkbox"/> % CPU Utilization	90	70	30
<input type="checkbox"/> % Disk Utilization	90	70	30
<input type="checkbox"/> % Filesystem Utilization	90	70	30
<input type="checkbox"/> % Memory Utilization	90	70	30
<input type="checkbox"/> % NIC Utilization	90	70	30

2.4 Control Plane Reporting and Tracing

Using the EMS, you can both extract signaling information and benefit from reporting and analysis capabilities. There are two options to monitor what is happening in the control plane and debug the network on the application level:

- Short term tracing
- Control plane KPI reporting

2.4.1 Short term tracing

Short term traffic tracing provides an in-depth traffic collection and inspection for troubleshooting purposes. The tracing tool collects messages that traverse the system according to predefined user tracing rules, based on specific AVPs in the protocol. Filters are applied at the session level. All messages of a session are traced. Multiple rules can be applied in parallel, any rule can be enabled or disabled and all the rules are applied on all the managed SDC nodes. *Figure 5* presents an example of configured tracing rules.

The detailed tracing output may be saved locally on each SDC site. This trace includes detailed message information, as well as the binary message itself.

In addition, the message is also be sent to the EMS and can be viewed via the EMS Web UI. *Figure 6* presents an example of the output for traced messages. You can zoom in to get a lower-level view with details related to specific presented message, as shown in *Figure 7*.



Figure 5: Configured Tracing Rules

ID	Enabled	Mode
TT-0	true	REPORT

Figure 6: Report of Traced Messages

Time	Session ID	Site	Filter ID	Protocol	CMD	Source Name	Source IP	Destination Name	Destination IP	Result Code
8/20/13 1:20:18 PM	Rs_109629639172	Site-51-20	TT-0	Diameter	CCAnswer	sdcm122-02_cpfi	sdcm122-02_cpfi_3868	client_Ra	172.28.48.170.37783	2001
8/20/13 1:20:18 PM	Rs_109629639172	Site-51-20	TT-0	Diameter	CCRequest	sdcm122-02_cpfi	sdcm122-02_cpfi_3868	sdcm122-02_cpfi	sdcm122-02_cpfi_3868	2001
8/20/13 1:20:18 PM	Rs_109629639172	Site-51-20	TT-0	Diameter	CCRequest	client_Ra	172.28.48.170.37783	sdcm122-02_cpfi	sdcm122-02_cpfi_3868	2001
8/20/13 1:20:17 PM	Rs_109629639171	Site-51-20	TT-0	Diameter	CCAnswer	sdcm122-02_cpfi	sdcm122-02_cpfi_3868	client_Ra	172.28.48.170.37783	2001
8/20/13 1:20:17 PM	Rs_109629639171	Site-51-20	TT-0	Diameter	CCRequest	sdcm122-02_cpfi	sdcm122-02_cpfi_3868	sdcm122-02_cpfi	sdcm122-02_cpfi_3868	2001
8/20/13 1:20:17 PM	Rs_109629639171	Site-51-20	TT-0	Diameter	CCRequest	client_Ra	172.28.48.170.37783	sdcm122-02_cpfi	sdcm122-02_cpfi_3868	2001
8/20/13 1:20:16 PM	Rs_109629639170	Site-51-20	TT-0	Diameter	CCAnswer	sdcm122-02_cpfi	sdcm122-02_cpfi_3868	client_Ra	172.28.48.170.37783	2001
8/20/13 1:20:16 PM	Rs_109629639170	Site-51-20	TT-0	Diameter	CCRequest	sdcm122-02_cpfi	sdcm122-02_cpfi_3868	sdcm122-02_cpfi	sdcm122-02_cpfi_3868	2001

Figure 7: Report of Traced Messages (details)

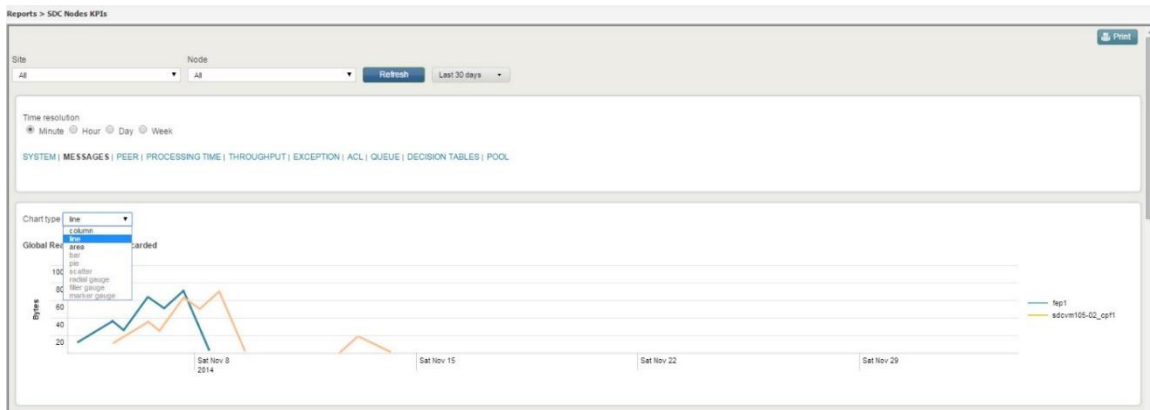
Session ID	Site	Filter ID	Protocol	CPF ID	CMD	Source Name	Source IP	Destination Name	Destination IP	Result Code
IScientC1_1096296391.000941	sdcm123-01_cpfi	TT-0	Diameter	42	ACA	sdcm123-01_cpfi	192.168.16.20.3002	sdcm123-01_cpfi	192.168.16.100.51216	2001
IScientC1_1096296391.000941	sdcm123-01_cpfi	TT-0	Diameter	42	ACA	sdcm123-01_cpfi	192.168.16.20.3002	sdcm123-01_cpfi	192.168.16.100.51216	2001
IScientC1_1096296391.000942	sdcm123-01_cpfi	TT-0	Diameter	42	ACR	sdcm123-01_cpfi	192.168.16.20.3002	sdcm123-01_cpfi	192.168.16.100.51216	2001
IScientC1_1096296391.000942	sdcm123-01_cpfi	TT-0	Diameter	42	ACA	sdcm123-01_cpfi	192.168.16.20.3002	sdcm123-01_cpfi	192.168.16.100.51216	2001
IScientC1_1096296391.000942	sdcm123-01_cpfi	TT-0	Diameter	42	ACA	sdcm123-01_cpfi	192.168.16.20.3002	sdcm123-01_cpfi	192.168.16.100.51216	2001
IScientC1_1096296391.000943	sdcm123-01_cpfi	TT-0	Diameter	42	ACR	sdcm123-01_cpfi	192.168.16.20.3002	sdcm123-01_cpfi	192.168.16.100.51216	2001
IScientC1_1096296391.000943	sdcm123-01_cpfi	TT-0	Diameter	42	ACA	sdcm123-01_cpfi	192.168.16.20.3002	sdcm123-01_cpfi	192.168.16.100.51216	2001
IScientC1_1096296391.000943	sdcm123-01_cpfi	TT-0	Diameter	42	ACA	sdcm123-01_cpfi	192.168.16.20.3002	sdcm123-01_cpfi	192.168.16.100.51216	2001
IScientC1_1096296391.000944	sdcm123-01_cpfi	TT-0	Diameter	42	ACR	sdcm123-01_cpfi	192.168.16.20.3002	sdcm123-01_cpfi	192.168.16.100.51216	2001



2.4.2 Control plane KPI reporting

A variety of Key Performance Indicators (KPIs) are collected and translated into reports, enabling the analysis of different message flows (for both client and server initiated messages), average roundtrip time, average message size, and others.

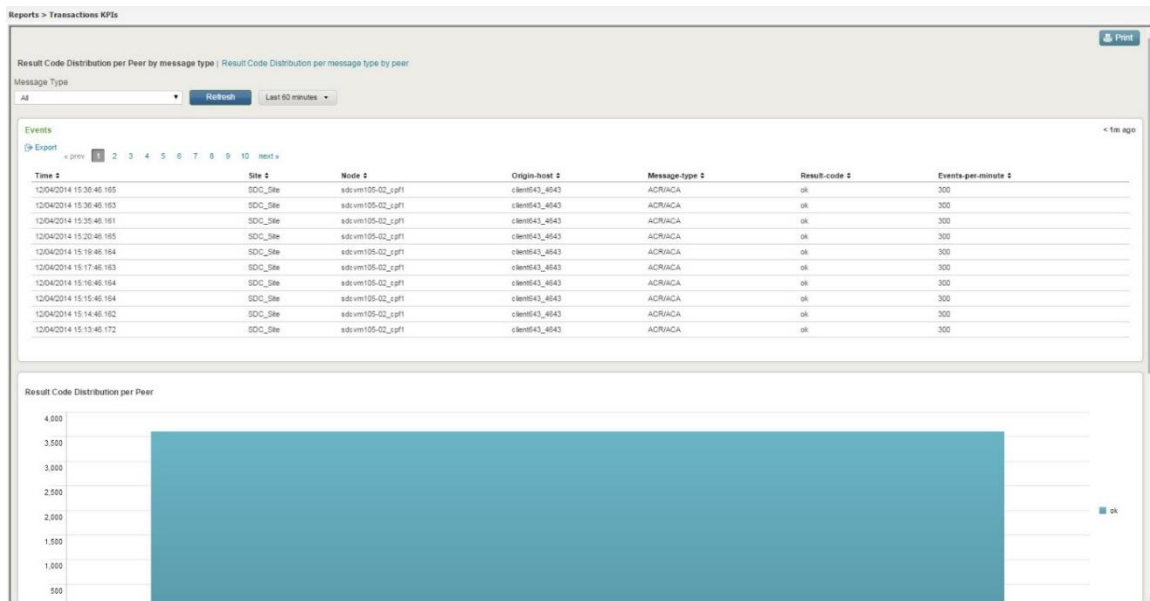
Figure 8: SDC Node KPIs screen



2.4.2.1 Transactions KPI report

The Transaction KPI report presents the status of transactions handled by the system (the different SDC sites) per peer per message type.

Figure 9: Transactions KPIs screen





2.4.2.2 Transaction Data records

This report presents the distribution of the handled requests between the different networks (home or visited) and the request status.

Figure 10: Transaction Data Records screen

Time	Origin_Realm	Origin_Host	Destination_Realm	Destination_Host	CMD_Code	Result_Code	Origin_Host_Request	Origin_Host_Answer	Diameter_Result_Code	IMSI	Roundtrip_Time	Source_Application_Id	Destination_Application_Id	Destination_Command_Cr
12/04/2014 15:53:59.055	dream.traffic.com	c1ent543_4543	dream.traffic.com	serverbloke	ACR	OK	(S)ent543	server.traffic.com	2001		50	3	3	ACA
12/04/2014 15:53:59.045	dream.traffic.com	c1ent543_4543	dream.traffic.com	serverbloke	ACR	OK	(S)ent543	server.traffic.com	2001		50	3	3	ACA
12/04/2014 15:53:59.043	dream.traffic.com	c1ent543_4543	dream.traffic.com	serverbloke	ACR	OK	(S)ent543	server.traffic.com	2001		50	3	3	ACA
12/04/2014 15:53:59.211	dream.traffic.com	c1ent543_4543	dream.traffic.com	serverbloke	ACR	OK	(S)ent543	server.traffic.com	2001		60	3	3	ACA
12/04/2014 15:53:59.079	dream.traffic.com	c1ent543_4543	dream.traffic.com	serverbloke	ACR	OK	(S)ent543	server.traffic.com	2001		58	3	3	ACA
12/04/2014 15:53:59.063	dream.traffic.com	c1ent543_4543	dream.traffic.com	serverbloke	ACR	OK	(S)ent543	server.traffic.com	2001		50	3	3	ACA
12/04/2014 15:53:58.531	dream.traffic.com	c1ent543_4543	dream.traffic.com	serverbloke	ACR	OK	(S)ent543	server.traffic.com	2001		59	3	3	ACA
12/04/2014 15:53:58.289	dream.traffic.com	c1ent543_4543	dream.traffic.com	serverbloke	ACR	OK	(S)ent543	server.traffic.com	2001		51	3	3	ACA
12/04/2014 15:53:58.079	dream.traffic.com	c1ent543_4543	dream.traffic.com	serverbloke	ACR	OK	(S)ent543	server.traffic.com	2001		50	3	3	ACA

2.4.3 KPI Sampling Frequency

KPIs are sampled every one minute.

2.4.4 Customizing the report display

You can aggregate different reports on different levels based on your specific needs, defining the report output in the following ways:

- Select to show data for specific sites, nodes, or peers
- Select to show data for specific time periods, as well as define the time resolution (1 minute, 5 minutes, 15 minutes, hourly, daily, weekly, monthly) that the data is displayed in
- Select to display the data as an area, line, column, bar, pie, or scatter graph, or as a radial, filler, or marker gauge. (Any unavailable option will be greyed out)
- Select a specific entity to view their data only



2.4.5 Exporting KPI data

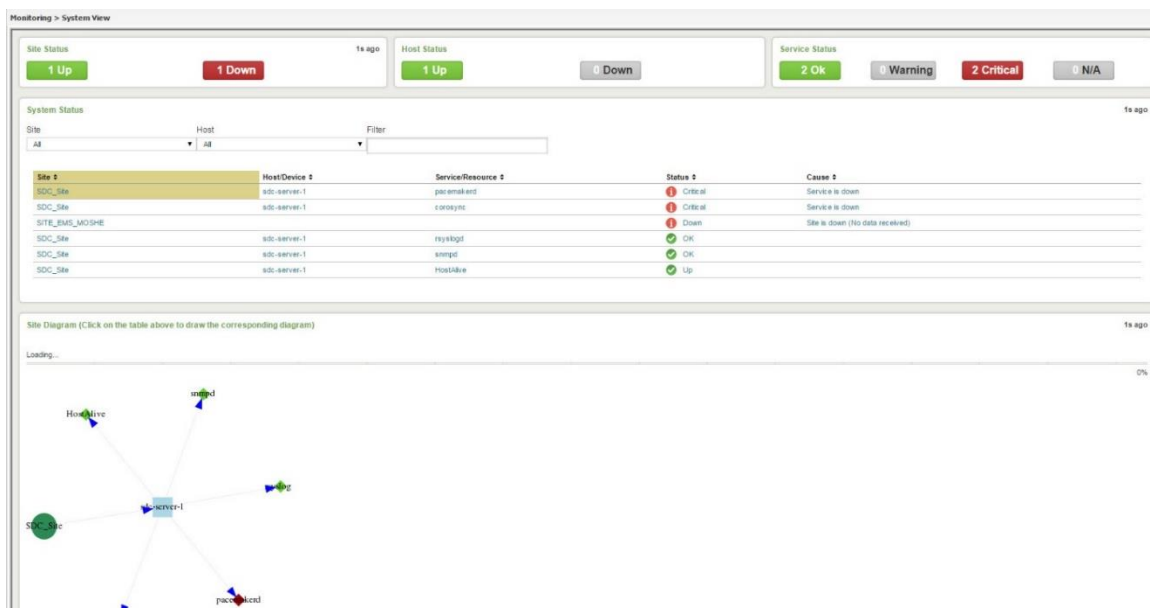
If desired, the tracing and KPI data presented in the reports can be exported in different formats, for example in CSV format.

2.5 Monitoring

2.5.1 System and Site monitoring

The EMS provides a system-wide view of all the managed SDC site platforms, including drilldown views to individual hosts in each SDC site and the status of the services/resources running on those hosts.

Figure 11: System View screen

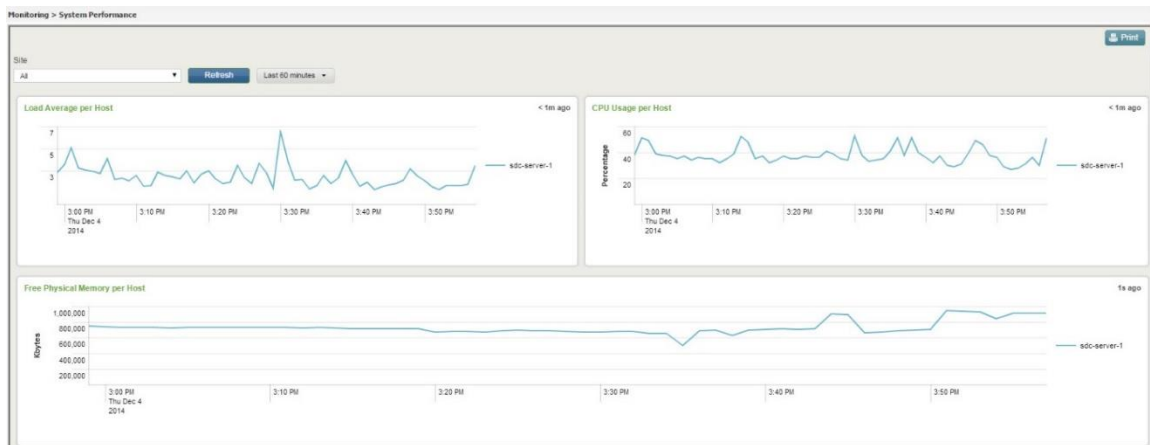


2.5.2 System and Site performance management

Through platform monitoring, you can monitor the system memory, network performance, disk usage and CPU indicators for all of the SDC sites managed by the EMS, in either aggregated or individual view.



Figure 12: System and Site Performance Graphs



2.6 Configuration management

The EMS enables centralized configuration management for all the SDC sites that it manages. The configuration of the SDC site that is managed by an EMS is limited in the SDC Web UI, and allowed only from the EMS Web UI to enable the configuration synchronization between the SDC sites managed by the EMS.

Figure 13: Configuring Routing Rules



The Audit screen in the EMS Web UI lists all the configuration changes performed using the EMS Web UI and the Web UI of the SDC sites managed by the EMS. You can select to roll back configuration change performed recently from this screen.

Figure 14: Configuration Changes Overview

Administration > Audit			
Rollback Release		Filter: Type Filter Text	
Time	Action	Site	Performed By
<input type="checkbox"/> 04/12/2014 11:04:55	Routing table definition for Session Binding has been modified.	Global	traffic
<input type="checkbox"/> 30/11/2014 12:05:36	Pool default has been edited.	SDC_Site	traffic
<input type="checkbox"/> 30/11/2014 12:05:27	Remote Peer server/cluster is added.	SDC_Site	traffic
<input type="checkbox"/> 30/11/2014 12:05:00	Remote Peer master/Peer server1 server2 server3 has been removed.	SDC_Site	traffic
<input type="checkbox"/> 26/11/2014 13:14:27	Remote Peer master/Peer is added.	SDC_Site	traffic
<input type="checkbox"/> 25/11/2014 14:53:24	Tracing definition for Traffic Tracing has been modified.	Global	traffic
<input type="checkbox"/> 25/11/2014 14:53:12	Routing has been modified.	Global	traffic
<input type="checkbox"/> 24/11/2014 16:00:09	Pool default has been edited.	SDC_Site	traffic
<input type="checkbox"/> 24/11/2014 15:59:33	Remote Peer server3 is added.	SDC_Site	traffic
<input type="checkbox"/> 24/11/2014 15:28:14	Pool default has been edited.	SDC_Site	traffic
<input type="checkbox"/> 24/11/2014 15:27:21	Link between site nodes to server1 has been Disabled.	SDC_Site	traffic
<input type="checkbox"/> 24/11/2014 15:23:34	Pool default has been edited.	SDC_Site	traffic
<input type="checkbox"/> 24/11/2014 15:20:50	Remote Peer server2 is added.	SDC_Site	traffic
<input type="checkbox"/> 17/11/2014 12:16:39	Pool default has been edited.	SDC_Site	traffic
<input type="checkbox"/> 16/11/2014 14:09:21	SNMP Target: Removed 172.29.43.42:162: public: Diklon factors have been set.	SDC_Site	traffic
<input type="checkbox"/> 16/11/2014 14:02:38	SNMP Target: Added 172.16.184.158:162: public: Diklon factors have been set.	SDC_Site	traffic
<input type="checkbox"/> 16/11/2014 13:59:31	SNMP Target: Added 172.29.43.42:162: public: Diklon factors have been set.	SDC_Site	traffic
<input type="checkbox"/> 16/11/2014 13:58:18	SNMP Target: Removed 172.29.43.36:1162: public: Diklon factors have been set.	SDC_Site	traffic
<input type="checkbox"/> 16/11/2014 13:40:17	SNMP Target: Added 172.29.43.36:1162: public: Diklon factors have been set.	SDC_Site	traffic
<input type="checkbox"/> 16/11/2014 13:40:58	SNMP Target: Removed 172.29.43.42:1162: public: Diklon factors have been set.	SDC_Site	traffic
<input type="checkbox"/> 16/11/2014 13:31:29	SNMP Target: Added 172.29.43.42:1162: public: Diklon factors have been set.	SDC_Site	traffic
<input type="checkbox"/> 12/11/2014 07:07:56	Remote Peer server1 is added.	SDC_Site	traffic
<input type="checkbox"/> 12/11/2014 07:07:37	Remote Peer server2 has been removed.	SDC_Site	traffic
<input type="checkbox"/> 12/11/2014 06:53:01	Remote Peer server1 has been removed.	SDC_Site	traffic
<input type="checkbox"/> 12/11/2014 06:50:37	Remote Peer server2 is added.	SDC_Site	traffic
<input type="checkbox"/> 12/11/2014 06:26:27	Dictionary Diameter has been modified.	Global	traffic
<input type="checkbox"/> 12/11/2014 06:26:05	License has modified: Added CDF-COMMERCIAL-Traffic Systems-0-0-100-2020-01-01-1-172.28.49.36-8a8f848b754a69a836...	SDC_Site	traffic
<input type="checkbox"/> 12/11/2014 06:24:35	Pool default is added.	SDC_Site	traffic
<input type="checkbox"/> 12/11/2014 06:24:01	Remote Peer server1 is added.	SDC_Site	traffic



3. Capacity and Storage

3.1 Central supervision

The EMS is fully optimized for remote monitoring from the centralized EMS Web UI.

3.2 Latency

The generated alarms, collected counters, statistics, traces are logged and visualized in near real time in the centralized Web UI. Most of the data is collected at one minute intervals, and the data arrives at the central EMS at a rate that will allow near real time monitoring.

3.3 Collected information storage

The collected information is stored in a reporting database that allows the execution of near real-time statistics report and queries without interfering or blocking the ongoing SDC operation.

Alarms, Metrics and system performance indicators with 60 minutes granularity are stored by default in the reporting DB for a period of 24 hours. The aging of the KPIs is configurable.

Tracing Data history capacity depends on general system sizing.

3.4 High availability

The EMS Server stores data collected from EMS sites persistently. The EMS Server is installed on at least two blades for high availability and redundancy.

3.5 Times synchronization

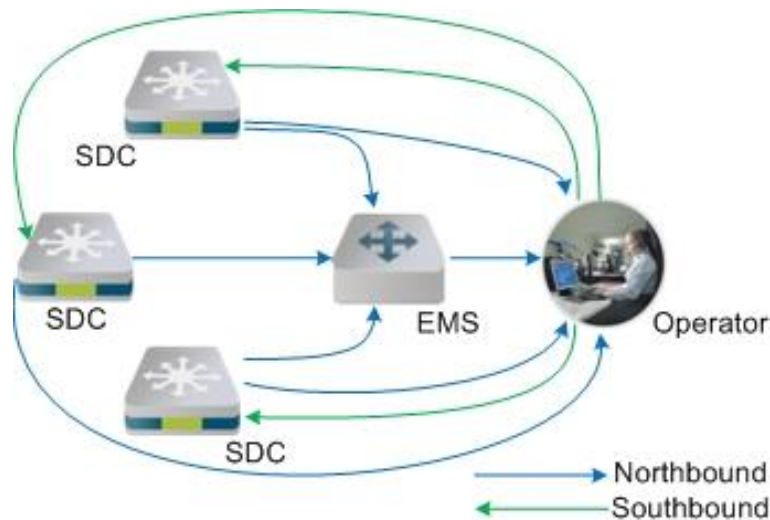
The timestamp of all the collected data from all the SDC sites managed by the EMS is synchronized to avoid data inconsistency caused by time zone differences between different interconnected SDC sites.



4. OAM Support

The EMS supports northbound and southbound protocols for Operation, Administration, and Maintenance (OAM). *Figure 15* presents both the northbound protocols, in which data is sent from the SDC and EMS nodes to the operator, and the southbound protocols, in which data is requested by the operator from the SDC and EMS nodes.

Figure 15: North and Southbound Protocols



The supported protocols are described in the following table.

Table 2: Supported protocols and directions

From	To	Direction	Protocol
SDC	Operator	Northbound	Syslog
SDC	Operator	Northbound	SNMP
SDC	Operator	Northbound	SFTP
EMS	Operator	Northbound	CSV
Operator	SDC	Southbound	SNMP
Operator	SDC	Southbound	SOAP/XML
Operator	SDC	Southbound	SFTP



Glossary

The following table lists the terms and abbreviations used in this document.

Table 3: Terms and Abbreviations

Term	Definition
AAA	Authentication, Authorization and Accounting
ACL	Access Control List
AF	Application Function
Answer	A message sent from one Client/Server Peer to the other following a request message
API	Application Programming Interface
AVP	Attribute Value Pair
CLI	Command Line Interface
Client Peer	A physical or virtual addressable entity which consumes AAA services
CPF	Control Plane Function
Data Dictionary	Defines the format of a protocol's message and its validation parameters: structure, number of fields, data format, etc.
DEA	Diameter Edge Agent
Destination Peer	The Client/Server peer to which the message is sent
DRA	Diameter Routing Agent
EMS Site	Element Management System Site
FEP-In	In-Front End Proxy
FEP-Out	Out-Front End Proxy
Geo Redundancy	A mode of operation in which more than one geographical location is used in case one site fails



Term	Definition
HA	High Availability
HSS	Home Subscriber Server
HTTP	Hypertext Transfer Protocol
IMS	IP Multimedia Subsystem
JMS	Java Message Service
KPI	Key Performance Indicator
LDAP	Lightweight Directory Access Protocol
LTE	Long Term Evolution
Master Session	The session for which the routing selection is performed based on the routing rules (Slave Sessions are applied with routing rules inherited from the Master Session)
MME	Mobility Management Entity
NGN	Next Generation Networking
Node	Physical or virtual addressable entity
OAM	Operation, Administration and Maintenance
OCS	Online Charging System
Origin Peer	The peer from which the message is received
PCEF	Policy and Charging Enforcement Function
PCRF	Policy and Charging Rules Function
PLMN	Public Land Mobile Network
Pool	A group of Server Peers
RADIUS	Remote Authentication Dial In User Service
Request	A message sent from one Client/Server peer to the other, followed by an answer message
SCCP	Signaling Connection Control Part



Term	Definition
SCTP	Stream Control Transmission Protocol
SDC	Signaling Delivery Controller
SDC Site	The entire list of entities working in a single site
Server Peer	A physical or virtual addressable entity which provides AAA services
Session	An interactive information interchange between entities
Slave (Bound) Session	A session which inherits properties from a master session
SNMP	Simple Network Management Protocol
SS7	Signaling System No. 7
TCP	Transmission Control Protocol
TLS	Transport Layer Security
Transaction	A request message followed by an answer message
Tripo	Session data repository
UDP	User Datagram Protocol
UE	User Equipment
URI	Universal Resource Identification.
Virtual Server	A binding point used by SDC to communicate with the Remote Peers (Clients and Servers)
VPLMN	Visited Public Land Mobile Network
Web UI	Web User Interface
WS	Web Service